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EXECUTIVE SUMMARY OF THE NATIONAL COMMUNICATION OF

SLOVAK REPUBLIC

submitted under Articles 4 and 12 of the
United Nations Framework Convention on Climate Change

In accordance with decision 9/2 of the Intergovernmental Negotiating Committee of the Framework Convention on Climate Change (INC/FCCC), the interim secretariat is to make available, in the official languages of the United Nations, the executive summaries of the national communications submitted by Annex I Parties.

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INTRODUCTION

1. Climate Change, caused by increasing anthropogenic emission of greenhouse gases (CO_2, CH_4, N_2O, CFCs, etc.,), represents the most serious environmental issue in the history of mankind. The United Nations Framework Convention on Climate Change (FCCC) is the first binding international legal instrument to address this issue. The ultimate objective of this Convention is to achieve stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a timeframe sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.

2. The Convention entered into force for the Slovak Republic on 23 November 1994. The Slovak Republic accepted the particular obligations resulting from the Convention, including the commitment to take measures aimed at returning emissions of greenhouse gases to the base year (1990) level by the year 2000. The Slovak Republic will undertake all activities to achieve the "Toronto target" (20 per cent CO_2 emission reduction in 2005 compared to 1988).

3. The first national communication of Slovakia submitted contains all current information concerning FCCC implementation process in Slovakia. This Communication was elaborated according to the INC/FCCC guidelines.

National circumstances

4. The Slovak Republic is an independent state since January 1, 1993 as a result of splitting the former Czech and Slovak Federal Republic. The new Constitution of the Slovak Republic was adopted on September 1, 1992. The President of the Slovak Republic is the head of the State. The Parliament is the supreme organ of State power and legislative authority. It has 150 deputies. The Government of the Slovak Republic is directed by the Prime Minister and it has 15 ministers. The legislative process is a combined effort of Ministries, Government and Parliament. The Slovak Ministry of the Environment, district environmental offices and municipalities are executive authorities concerning environment (Act 595/1990). Slovakia is one of the Central European Countries undergoing the process of transition from a central planned economy to a market economy. Transformation of the whole economy together with disintegration of the Common East European market have caused a deep depression of industrial production and substantial decrease in the Slovak gross domestic product (GDP).

5. Slovakia lies at the heart of Europe. The area of the country is 49,036 km^2, including agriculture land (24,471 km^2), arable land (14,860 km^2), forest land (19,911 km^2), water area (940 km^2) and built-up areas (1,275 km^2). Slovakia is a mountainous country, 60 per cent of its territory is over 300 m a.s.l. Slovakia is in the mild climate zone. The average annual precipitation for the whole country of Slovakia is 743 mm, 65 per cent of this is evaporated and 35 per cent represents runoff. A temperature increase of about 1°C and precipitation decrease of about 10-15 per cent were observed during the last 100 years.

6. The population of Slovakia has grown from 3 million inhabitants in 1920 to 5.3 million in 1992. The highest natural population increment (over 1.7 per cent) occurred in 1950, while in 1992 it was 0.4 per cent.

7. Slovakia is an industrial country. The industry and construction share of GDP represented over 50 per cent in 1991. High demand for energy and raw materials (production of iron, steel, aluminium, cement, fertilisers, plastic materials, etc.) is the characteristic feature of the Slovak economy. However, there is a shortage of domestic sources of high-quality raw materials (excluding non-ore material and magnesite).

8. Agriculture and forestry in Slovakia employed about 250,000 people in 1992, which is equivalent to 4.7 per cent of the population. The per capita acreage of 0.46 hectares of farmland is relatively small. During the first years of economic transformation no significant changes in crop production were registered, but all forms of animal production dropped significantly. The forest is one of Slovakia's most important natural resources and is the basis for the forest industry. In 1991, Slovak timber resources represented 352 million m^3.

9. Slovakia, a typical inland country, is situated on the "roof" of Europe. Therefore, its natural water resources are limited. Average discharge of 405 $m^3.s^{-1}$ results from runoff. During the last several decades a significant decrease of Slovak rivers discharge has been observed. Several regions of Slovakia exhibit a considerable soil moisture deficiency. More than 800,000 hectares of arable land need irrigation.

Inventory of greenhouse gas emissions

10. The Slovak Republic's share of global anthropogenic greenhouse gases emission is approximately 0.2 per cent. Annual per capita CO_2 emission cca 11 tonnes in 1990 is lower than the Organisation for Economic Co-operation and Development (OECD) countries average. Nevertheless it places Slovakia among the 15 States with the highest per capita emissions.

CO_2 emissions

11. The primary sources of atmospheric CO_2 in Slovakia is fossil fuel combustion. Cement (lime) production is another important source. Changes in land use and forestry generally act as a sink for CO_2. While the combustion of fossil fuels accounts for about 94 per cent of total Slovak CO_2 emissions, CO_2 also results directly from industrial processes. Table 1 shows the total CO_2 emissions and removals in Slovakia in 1988 and 1990.

12. Approximately 83 per cent of energy in the Slovak Republic is produced through the combustion of fossil fuels. The remaining 17 per cent comes from other energy sources such as nuclear energy, hydropower or renewable sources.

Table 1

Total CO_2 emissions and removals in 1988 and 1990

	1988	1990
National CO_2 emissions (Gg)		
Total emissions	61 484	58 278
Natural CO_2 removals (Gg)		
Land use change	3 938	4 451

Table 2

Breakdown of energy balance and energy related CO_2 in 1990

Fuel combustion activities	(PJ)	CO_2 emission (Gg)
Energy		15 679
Commercial/Institutional		6 153
Residential		6 384
Industry		21 155
Transport		3 628
Agriculture/Forestry		2 034
Total	764.93	55 033
Solid	344.35	32 184
Liquid	196.76	11 011
Gaseous	223.82	11 838

Feedstocks and Carbon Storage

13. Total volume of carbon stored in products (pitch oil, tar, petrochemical crude oil products, industrial fertiliser) in 1990 was specified as 1064 Gg C according to the Intergovernmental Panel on Climate Change (IPCC) method, and 736 Gg according to the national method.

CO_2 removals

14. The Slovak Republic's area is 49,036 km^2, including 41 per cent forest land. The land use has remained fairly constant over the last century. In the same period, meadows and pastures have been converted to arable land. "Forestry and land use change" in our territory remains a sink of approximately 4,451 Gg of carbon dioxide/year.

Trends

15. It is rather hard to evaluate the CO_2 emission trends, because generally only data from 1990 are available. In general, CO_2 emissions were increasing until 1988, after 1990 they began to decrease. It is assumed that this trend will continue after 1993 as a consequence of economic depression.

CH_4 emissions

16. In Slovakia, the major sources of methane are represented by agriculture (livestock farming and manure), fuel extraction (brown coal), transport (natural gas network) and waste treatment.

N_2O emissions

17. A complete list of N_2O sources and emissions has not yet been developed for the Slovak region. It was not possible to quantify some of the sources and some remain hidden. N_2O emissions are caused by excess mineral nitrogen in the soil as a consequence of intense fertilisation and of unfavourable air regime of soil (the use of heavy machinery during cultivation).

Other gases

18. CFCs and HCFCs emissions are not known. Only data on their consumption are available. Their use is controlled within the Montreal Protocol. The major NO_x and CO sources are power engineering and transport. Metallurgy is also an important source of CO emissions. Anthropogenic emissions of non-methane volatile organic compounds (NMVOCs) were specified within the implementation of the Protocol on NMVOC emissions reduction in the Slovak Republic. The application of paints and solvents together with extraction, transport, processing and use of crude oil and its products are the major sources.

Aggregated emissions

19. The values of aggregated emissions consider both primary and secondary contribution of greenhouse gases according to the IPCC methodology (IPCC 1994, global warming potential (GWP) 100 yrs). CO_2 emissions contribute 81 per cent of the total emissions, CH_4 emissions contribute 12 per cent and N_2O emissions 7 per cent (expressed as the CO_2 equivalent).

Table 3

CH_4 emissions (Gg) in 1988, 1990, 1993

	1988	1990	1993
Fossil fuel combustion		21	
Fugitive emissions		96	
Agriculture	188	172	112
Waste treatment	50	53	58
Forest ecosystems	(5)	5	(5)
Total		347	

Table 4

N_2O emissions (Gg) in 1988, 1990, 1993

	1988	1990	1993
Fossil fuel combustion		3.8	
Industrial processes	2.0	2.1	1.1
Agriculture	(10.0)	8.8	3.6
Water surfaces	1.3	1.3	1.3
Total		16.0	

Table 5

Anthropogenic emissions of NO_x, CO and NMVOC (Gg) in 1988, 1990 and 1993

	1988	1990	1993
NO_x	198[1]	227	184
CO	457	489	480
NMVOC	(156)	147	116

[1] data from 1987

Table 6

Aggregated emissions considering direct and indirect effects of CO_2, CH_4 and N_2O emitted in 1990 (aggregated emissions were calculated from emission data rounded to Gg)

	CO_2	CH_4	N_2O	Aggregated
	(Gg)	(Gg CO_2 equivalent)		
Energy/heat generation, Transport	55 033	515	1 216	56 764
Fugitive emissions	NE	2 352	NE	2 352
Industry	2 775	NE	672	3 447
Agriculture	NE	4 214	2 816	7 030
Forestry	(-4 451)[1]	122[2]	416[3]	538
Waste treatment	470	1 299	NE	1 769
Total	58 278	8 502	5 120	71 900

[1] carbon sinks are not included in total CO_2 emission
[2] emissions from wetlands
[3] emission from water surfaces

Climate change - Strategy and policy

20. The Slovak Republic has not yet adopted a national policy relevant to climate changes. Similarly there is no integral systematic programme for the reduction of greenhouse gases emissions or enhancement of sinks. In a relatively short time during the period of political and economic transformation of the society and the development of a new state a range of acts, regulations and measures, indirectly related to greenhouse gases emissions reduction or enhancement of sinks, was adopted. In addition several research projects linked with climate change were finished or are being prepared.

21. The first National Communication introduces a survey of relevant activities originally devoted to other goals but indirectly linked to greenhouse gases emission reduction. It will represent an effective instrument for the implementation of the Framework Convention on Climate Change until the national policy directly related to greenhouse gases emissions is adopted.

22. Within the framework of the Slovak Republic´s Country Study, a proposal for climate change policy and an action plan will be developed. After its adoption by the Government of the Slovak Republic it will represent a consistent national policy on climate changes. This policy will be presented in the Second National Communication.

23. Because the historical development of the economy of the Slovak Republic has been energy intensive, the attention should be focused on seeking possibilities for the improvement of energy utilisation efficiency. Most of the important measures which result in energy savings are directly linked with CO_2 emissions reductions as a considerable share of energy in Slovakia is obtained from the combustion of low grade fuels.

24. The development of the economy of Slovakia before 1989 was substantially based on heavy industry with high energy intensity. The national economy restructuring needs an effective energy conservation policy. The following items should be taken into consideration:

- domestic energy sources to cover the total consumption represent only cca 10 per cent (1990);
- the consumption of primary energy sources per capita is very high (178 GJ-1990).

25. The fundamental document for energy sector development is Energy Strategy and Policy of the Slovak Republic up to the year 2005. In this document the national target of CO_2 emissions reduction is defined directly, as follows

26. The energy policy is based on the following key assumptions:

- substantially higher use of natural gas for electricity and heat cogeneration in combined cycles,
- implementation of fuel and energy efficiency programmes,
- increasing use of renewable energy resources (mainly biomass and geothermal),
- reconstruction of the two largest Slovak fossil fuel power plants (fluid combustion, desulphurisation and denitrification),
- exploitation of the hydroenergetic potential of the Slovak Republic up to 65 per cent,
- completion of all four units in the Nuclear Power Plant Mochovce (4 x 440 MW),
- to close V1 NPP operation in Jaslovské Bohunice (2 x 440 MW) within one year after commissioning and full power operation of the first two units of NPP Mochovce.

27. Fulfilment of the above assumptions will result in a significant decline in energy produced from the combustion of fossil fuels (mainly low grade coal), directly ensuring a significant CO_2 emission abatement.

28. Legislative instruments, economic tools and other measures with direct and indirect effects on greenhouse gas (GHG) emissions are summarised in the following review. Details are given in Chapter 4 of the full National Communication.

29. Measures fully or partly implemented

Energy sector

- Act No. 89/1987 on production, distribution and consumption of heat
- Act No. 88/1987 and No. 347/1990 on Energy Inspectorate
- Act No. 316/1993 on consumption tax
- Price liberalisation of energy and fuels
- Information campaigns
- Training and education
- Demonstration projects
- Programme supporting the economic activities resulting in savings of energy and imported raw materials
- Programme supporting the building of renewable energy sources

Residential and service sectors

- Programme of additional insulation and removal of defects in apartment houses
- Programme of energy consumption reduction in apartment and family houses

Transport sector

- Act No. 316/1993 on consumption tax on hydrocarbon fuels and lubricants
- Act No. 87/1994 on road tax
- Inspection of vehicles in use (Act No. 309/ 1991)
- Establishment and development of combined transport (Governmental Decisions Nos. 833/1992 and 644/1991)
- Lowering of ineffective transport in municipal agglomerations
- Preference of electric to diesel railway transport
- Use of alternative fuels

Cross sectoral measures

30. At present the most important indirect legislative instrument to reduce the CO_2 emissions is represented by effective air protection legislation:

- Act No. 309/1991 on the protection of the air against pollutants
- Decree of the Slovak Commission for the Environment No. 407/1992 on emission standards
- Act No. 134/1992 on the state administration of air protection
- Act No. 311/1992 on charges for air pollution

- Act No. 128/1992 on state fund for the environment
- Decree No. 176/1992 on conditions for providing and use of the financial means from state fund for the environment
- Information materials - energy savings, renewable sources

31. Measures considered for the future

Energy sector

- Act on energy management
- Principles of regional energy policy
- Institutional building of project identification and implementation to reduce the greenhouse gases
- Establishment of a fund to increase energy efficiency
- Energy audits
- Demand side management
- Labelling of Appliances
- Legislative regulation on using of waste heat in industry

Residential and service sectors

- Standardisation of heat insulation of buildings

Transport sector

- Optimisation of motor-car traffic in cities
- Municipal charges
- Tax on motor-cars
- Preference for public transport
- Lowering of permissible speed
- Development of cycling
- Education

Measures to reduce the emissions of other greenhouse gases

32. Measures fully or partly implemented

Methane

Waste management

- Programme on waste management
- Act No. 239/1991 on waste

- Ordinance of the Slovak Government No. 605/1992 on keeping evidence on waste
- Ordinance of the Slovak Government No. 606/1992 on waste treatment
- Act of the Slovak National Council No. 309/1992 on charges for waste disposal
- Economic instruments to improve waste management

Agriculture

- Act No. 307/1992 on the protection of farmland
- Act No. 61/1964 on development of crop production
- Directive of Ministry for Agriculture and Nutrition of the Slovak Republic No.5001/ 1982 on manipulation with and utilisation of liquid manure and liquidation of ensilage juices
- Ordinance of the Government of the Slovak Republic No. 606/1992 on Waste Treatment

Nitrous oxide

Agriculture

- Act No. 307/1992 on the protection of farmland
- Act No. 61/1964 on development of crop production
- Directive of Ministry for agriculture and nutrition of the Slovak Republic No. 5000/ 1982 on water protection against agricultural contamination
- Directive of Ministry for agriculture and nutrition of the Slovak Republic No. 5001/ 1982 on manipulation with and utilisation of liquid manure and liquidation of ensilage juices.

Methane

Waste management

- Updating of legislative measures
- Technical standards implementation

Energy sector

- Implementation of measures to lower the leakage of natural gas from gas-piping system including local distribution network

Nitrous oxide

Agriculture

- Codex on quality assurance in agricultural practice
- Action plan for the reduction of water nitrate contamination
- Methodology of special agriculture practice in areas of hygienic protection of water sources and in polluted areas

33. Volatile organic compounds and carbon monoxide are not radiatively active gases but they indirectly support the greenhouse forcing. The Government of Slovak Republic decided to accede to Economic Commission for Europe UNO Protocol on the reduction of volatile organic compounds emissions (30 per cent reduction by the year 2000 compared to the year 1990). Ratification of this Protocol in the Slovak Parliament is expected during 1995. Further measures to reduce VOCs and CO result from effective air pollution legislation (emission standards, BATNEEC, charging of polluters, three-way catalytic converters, etc.).

34. Afforestation of 50,000 hectares governmental non-forest land not suitable for agricultural utilisation is expected by the year 2000.

Projection and assessment of effects of measures

35. The estimation of future trends in greenhouse gases in a country with an economy in transition is complicated by the process of economy restructuring. In the first National Communication the largest emphases have been given on energy related CO_2 production. Non-energy related CO_2 projection is primarily based on the future development of lime and cement production. The other GHGs emission projection is estimated on the assumption of additional development of the agricultural and forestry sectors as well as on the future development of waste management.

Energy-related CO_2 emission projection

36. The energy-related CO_2 emission projection is based on the Energy Strategy and Policy of the Slovak Republic up to the year 2005. The following measures have been considered in this energy policy:

- The share of natural gas will increase for end use of energy as well as in the electricity generating process (the installation of new combined cycles facilities). The latter represents the impact of new environmental legislation.

- The 31.5 PJ decrease in fossil fuel consumption using energy conservation measures is considered for the year 2005.

- The new nuclear power plant Mochovce will be put in operation.

- The increasing share of renewable energy sources in national primary energy balance.

37. Considering these measures, the solid fuel consumption will decline between 1990-2005 by 36.1 per cent and liquid fuels by 10.4 per cent. This energy consumption decline will be offset by increasing gaseous fuels consumption by 38.1 per cent, biomass consumption by 21.9 per cent and by the increasing share of primary nuclear heat by 48.5 per cent. Due to the decline in fossil fuel consumption as well as due to the change of fuel types a CO_2 decrease in the year 2000 of 15.7 per cent from the base year is expected. This fact is important concerning meeting the FCCC requirements of GHGs stabilisation, because energy related CO_2 represents 94 per cent of the domestic emission total in 1990. The total CO_2 projection, based on the Energy Policy is summarised in Table 7.

Table 7

Energy-related CO_2 emission projection (Gg/year)

Fuels	1990	1995	2000	2005
Solid	32 185	24 335	22	20 576
Liquid	11 010	10 219	314	11 060
Gaseous	11 839	11 669	10	16 351
Total	55 033	43 223	518 46 373 341	47 987

38. The national target of Slovakia is to reduce the energy-related CO_2 emission in period 1988-2005 by 20 per cent. The energy demand scenario from the Energy Policy projects a fossil fuel consumption increase in 2005 due to the national economic revival and a progressive increase of GDP in this period. In this case the projected CO_2 decline between 1988-2005 will be only 17.6 per cent. In the Energy Policy only a minimal energy saving potential is considered (31.5 PJ). This document was prepared in 1993, therefore the new energy data from the transportation sector has not been incorporated in the energy balance. To achieve the national target, the following scenarios of CO_2 emission have been assumed, considering the energy saving potential and new data from the transportation sector:

Scenario A: Business as usual

Scenario B: Based on the *Energy Policy* (energy conservation 31.5 PJ in 2005) and the new data from transportation sector.

Scenario C: Scenario B, 10 per cent reduction of CO_2 emission in the transportation sector, energy conservation 50.2 PJ in 2005

Scenario D: Scenario C, the energy conservation 126 PJ in 2005 (full energy saving potential).

39. The individual scenarios are summarised in Table 8. It is obvious, that at assuming the business as usual energy consumption development, as represented by Scenario A, the CO_2 emission level in 2000 will not exceed the level 1990. It is important from the point of view of FCCC commitment to stabilise GHGs emission until 2000. The National Target will be achieved under Scenario B.

Table 8

Energy-related CO_2 emission projection scenarios [Tg]

	1988	1990	1995	2000	2005
Scenario A	58	55	46	51	63
Scenario B	58	55	46	46	47
Scenario C	58	55	46	46	45
Scenario D	58	55	46	46	41
National Target					47

Non-energy related CO_2

40. Using the cement, lime and magnesite production data the non-energy related CO_2 emission projection was estimated (Table 9).

Table 9

Non-energy-related CO_2 emission production [Gg]

	1988	1990	1995	2000	2005
Cement	2 005	1 853	1 467	1 565	1 956
Lime	473	451	303	316	355
Magnesite	522	471	362	385	472
Total	3 000	2 775	2 132	2 266	2 783

Emission of other GHGs

41. The emissions of other GHGs (CH_4, N_2O) have been balanced on the projected activity data from the power industry, industrial processes, agriculture, forestry and waste management (Table 10 and 11).

Table 10

CH_4 emission projection (Gg/year)

	1990	1995	2000	2005
Landfills	53	51	51	51
Agriculture	172	140	130	130
Combustion	21	18	18	18
Fugitive emission	96	88	94	102
Total	342	297	293	301

Table 11

N_2O emission projection

	1990	1995	2000	2005
Biomass combustion	3.8	3.2	3.2	3.3
Agriculture	8.8	3.6	8.8	10.0
Industry	2.1	1.2	2.1	2.1
Total	14.7	8.0	14.1	15.4

Aggregated emission projection

42. Table 12 illustrates the aggregated emission projection of GHGs (expressed as CO_2). Scenario B for energy-related projection of CO_2 emissions was applied. CO_2 emissions from the waste incineration was not included.

Table 12

Aggregated emission projection of GHGs expressed as CO_2 [Gg] (GWP-IPCC 1994, 100 years)

	1990	1995	2000	2005
CO_2 energy related	55 033	46 223	46 373	47 987
CO_2 non-energy	2 775	2 132	2 266	2 783
related	8 502	7 390	7 295	7 495
CH_4	5 120	2 978	4 917	5 333
N_2O				
Total	71 430	58 723	60 851	63 598

Vulnerability to climate change and adaptive strategies

43. The climate in Slovakia is influenced predominantly by its position in Central Europe, by the topography of the Western Carpathian Mountains and the Alps and by prevailing westerly zonal atmospheric circulation. The period from the 15th of July to the 15th of October is relatively dry in the South of Slovakia. Southern and south-western Mediterranean cyclones cause heavy precipitation in the south and east half of Slovakia

mainly from October to December and in May and June in some years. On the other hand, the western and north-western atmospheric currents bring precipitation predominantly to the mountains in western and northern Slovakia. Any change of atmospheric circulation may significantly affect the descried simplified scheme of climate conditions over the entire country of Slovakia. Projected warming of the climate may change the climate in Slovakia toward higher variability and this could change the limits for both natural ecosystems and socio-economic activities.

44. From the historical climatic trends and variability analysis follow:

- trend of annual air temperature means from 1901 is significantly positive by about 1°C with maximum in the last 7-year period;
- trend of annual precipitation totals is significantly negative by about 90 mm in southern Slovakia with a minimum in the last 14-year period (decreasing trends of lesser magnitude have been found in Slovakia generally, but the trend is not significant in the northern mountains);
- trend of annual potential evaporation totals is significantly positive by about 125 mm in the south-west Slovakia with a maximum in the last 7-year period (trends from 10 to 15 per cent have been found in other regions of Slovakia);
- trend of annual actual evaporation is decreasing in southern Slovakia with a minimum in the last 7-year period and increasing in the northern mountainous half of Slovakia where precipitation is comparable or higher than potential evaporation;
- values of calculated annual mean usable soil moisture is significantly decreasing mainly in south-western Slovakia by about 25 per cent of the 1961-1990 means and by about 10-20 per cent in the other regions;
- air temperature and precipitation trends are caused mainly by the change of climatic characteristics in the season from April to September;
- occurrence of exceptional monthly means and totals in the period 1981-1994 was more frequent than in the periods before 1981;
- in the mountainous part of Slovakia a great surplus of precipitation totals comparing potential evaporation occurred in the first three decades of this century, but after 1980 there was a similar deficiency of precipitation like the lowlands.

45. Assessments listed above clearly indicate trends toward higher aridity, predominantly in the southern part of Slovakia. The mean discharges of Slovak rivers have decreased by 10-30 per cent (some smaller rivers in the South by more than 40 per cent) since 1931.

Preliminary climate change scenarios

46. Scenarios of temperature rise by 1-2°C (in comparison with the means of the 1951-1980 period) are considered in accordance with GCMs (General Circulation Models) for the periods about the year 2025. Precipitation totals rise in winter and decrease in the vegetation period (April-September) by about 20 per cent is expected (generally greater precipitation decrease is assumed in southern Slovakia). The mean relative air humidity will probably decrease year round (the greater decrease – about 6 per cent – is expected in southern Slovakia in the spring months). Preliminary scenarios are presented in the Slovak National Climate Programme reports. More detailed development of climate scenarios is planned in the Country Study Project in 1995.

Climate change impacts and adaptation

47. Preliminary assessments, based on the present state of knowledge, existing climatic and hydrological trends and projected changes over the next decades have been estimated in the Slovak National Climate Programme Project and in other research projects in Slovakia. The results obtained are considered as a rough risk assessment only, but they are usable as a basis for framework strategies. Because of the progress of impact assessment in the hydrological cycle, forest ecosystems and partly in crop production, only these three sectors could be included into the First National Communication of FCCC implementation in Slovakia.

48. *Hydrology, water resources and water management.* According to simple model calculations (using preliminary climate change scenarios) the continuation of present trends (river discharges, ground water levels and spring yields decreases) is expected mainly in the southern half of Slovakia. This may negatively influence not only the water supply for the public, industry and agriculture, but also hydropower plants and river transport systems use in Slovakia. Scenarios of about a further 20 per cent decrease of water resources were preliminary identified for the period 1990-2030.

49. *Forest ecosystems.* Based on regional climate scenarios (temperature, precipitation) as well as from concentrations of some gases in the atmosphere (greenhouse gases, photooxidants, etc.), it will be necessary to implement the following measures:

- acceleration of Norway spruce monocultures change to mixed stands of pine, oak, beech and the other broad leafed species;

- to preserve biodiversity of forest communities extensively in forest management;

- preparation of genetic material for the artificial regeneration to changed climate, reevaluation of forest management plans;

- to increase carbon dioxide fixation by afforestation of soils unused in agriculture.

50. *Agriculture (crop production).* Climate change impacts upon agriculture is very complex, partly positive, but mostly negative. Mitigation of negative impacts and utilisation of positive ones should be prepared for well in advance, because of the long-term nature of adaptation processes in agriculture systems and in agricultural ecosystems as well. The projected adaptive measures are as follows:

- change in crop cultivation technologies;
- change in agroclimatic regionalisation, and structure of crops and varieties cultivated;
- change in breeding objectives;
- change in plant protection;
- regulation of the water supply considering expected changes of the hydrological cycle;
- regulation of water and energy regimes of fields by mulching;
- improvement of soil fertility from the point of view of sustainable agriculture.

Joint implementation of FCCC commitments

51. Considering the joint implementation (JI) of the FCCC commitments, the position of the Slovak Republic is as follows:

- JI is economically effective as it allows the achievement of the maximum greenhouse gases emissions reduction at the lowest cost;

- the countries listed in Annex I should reach greenhouse gases emission stabilisation "at home", without the use of JI;

- JI is a voluntary activity under the responsibility of two or more Parties; such activity must be undertaken or accepted by the Governments concerned;

- a three-year pilot phase, to gain experience, is recommended;

- during the pilot phase, the credits do not yet apply;
- the criteria for the pilot phase should be flexible.

52. To ensure that the commitments of the Slovak Republic resulting from the Convention are met effectively, a National Panel for Collection, Evaluation and Implementation of Greenhouse Gases Emission Reduction Projects is planned. In the Slovak Republic the joint implementation mechanism has not been applied to date.

Climate change research

53. Climate changes have been studied for a long time in research projects of the Slovak Hydrometeorological Institute, Department of Meteorology and Climatology at Comenius University and Geophysical Institute at the Slovak Academy of Sciences. Recently, the study of these issues has been initiated at the Institute of Hydrology of the Slovak Academy of Sciences, the Agriculture University in Nitra and the Forest University and the Forest Research Institute in Zvolen. National research programmes are listed below:

- National Climate Programme of the Slovak Republic;
- National Programme of Greenhouse Gases Emission Reduction;
- National Programme to Reduce the Emission of Volatile Organic Compounds;
- Hydrological regime changes as the result of global changes;
- Slovak National Programme to Stabilise And Reduce CO_2 Emissions in Transportation;
- The Slovak Republic's Country Study to Address Climate Change (the second round of the United States Country Study Programme).

54. These longterm programmes were established and supervised by the Slovak Ministry of the Environment and are financed primarily from the state fund of the environment. More then twenty institutions are involved in this research. The Slovak Hydrometeorological Institute is the main research coordinator. Details can be found in Chapter 8 of the full National Communication. In the present economic situation, costly technology research and development stagnates in Slovakia. Governmental funding is very limited and private sector interest is still absent.

Education and public awareness

55. Public awareness concerning climate change in the Slovak Republic is still low. An educational campaign, started in last three years, will be intensified. Great importance will be given to cooperation with non-governmental organizations. Special emphasis will be attached to communication among policymakers, researchers and the general public in order to improve general awareness, to support the feeling of political responsibility and to accelerate the FCCC implementation process.